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A SYSTEM OF
BOTANICAL ANALYSIS

APPLIED TO THE
DIAGNOSIS OF
BRITISH NATURAL ORDERS.

For the Use of Beginners.

BY

W. HANDSEL GRIFFITHS, PH.D.



LONDON:
WYMAN & SONS, 74-5, GREAT QUEEN STREET,
LINCOLN'S-INN FIELDS.

1870.

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WYMAN AND SONS, PRINTERS, GREAT QUEEN STREET

LINCOLN'S-INN FIELDS, W. C.

PREFACE.

THE following pages were originally written for, and are now published at the request of, the Author's pupils.

The object which the Compilation is intended to fulfil is to afford to students commencing the study of Botanical Classification a concise, simple, and systematic guide to the Diagnosis of our British Natural Orders.

In the selection of diagnostic data, reference has been had rather to facility of recognition than to morphological significance, and, as the Work is merely designed for practical analysis in the field, *almost all matter has been excluded which is not essential for the purposes of diagnosis.* It should be borne in mind that the characteristics specified as pertaining to Orders are not always without exception, and *in some cases are applicable only to British representatives.* The attention of beginners should also be directed to the fact that in the following System, as in all methods of Artificial Analysis, *the Orders are not arranged according to their Natural Affinities,* in some cases Orders being placed in apposition which should be widely separated, and *vice versâ.*

Inasmuch as it is presumed that no student will commence the study of Systematic Botany without having previously mastered the outlines of Morphology, technicalities have been freely used throughout the Work.*

* It is necessary to state that in the following pages the term *Polycarpellary* signifies an ovary composed of more than one carpel; *Plurilocular*, the existence of more than two cells; *Polyandrous*, a greater number of stamens than ten; and *Oligandrous*, ten or fewer stamens.

Some of the Orders are printed *in italics*, to signify that they do not properly belong to the Group under which they are so printed, but that some of their representatives exhibit approximative characters of the Group.

Very few words are needed as to the method of using the following pages. In examining a plant, it is consecutively referred to its Sub-kingdom, Division, Subdivision, Class, Sub-class, and Group; the analysis of the Group is then followed, and the Order of the plant arrived at. When the student has diagnosed the Order, he should refer to his text-book, and study therefrom the characteristics of the Order *in extenso*. It is hoped that by this means the study of Systematic Botany will be facilitated for beginners, and rendered a pleasant, as well as a profitable, expenditure of time.

The Author, in conclusion, desires to acknowledge, as valuable sources of information, the works of Bentham, Balfour, Bentley, Henslow, Henfrey, Hooker and Arnott, Lindley, Oliver, and many others; and he would record his gratitude to those gentlemen who have so kindly afforded him their assistance and advice.

W. HANDSEL GRIFFITHS.

LONDON, *May*, 1870.

A SYSTEM OF BOTANICAL ANALYSIS
APPLIED TO
THE DIAGNOSIS OF BRITISH NATURAL ORDERS.

SUB-KINGDOM PHANEROGAMIA.

Flowering plants. Propagate by seeds containing an embryo.

DIVISION 1.—*DICOTYLEDONES* or *EXOGENÆ*.

Embryo with two or more opposite cotyledons. Wood exogenous. Leaves usually net-veined.

Flowers usually formed on a quinary or quaternary type.

SUBDIVISION 1.—*Angiospermiæ*.

Ovules contained in an ovary, and fertilized through the intervention of a stigma.

CLASS 1.—*DICHLAMYDEÆ*.

Perianth double.

SUB-CLASS 1.—*POLYPETALÆ*.

Petals wholly distinct.

Group 1.—HYPOGYNÆ (Thalamifloræ).

Stamens hypogynous.

Ovary monocarpellary.	BERBERIDACEÆ (<i>Barberry order</i>). Shrubs. Perianth and Stamens in twos or threes, or their multiples. Anthers opened by recurved valves.		
Ovary polycarpellary.	<i>Papilionaceæ</i> . Stamens mon- or diadelphous. Corolla irregular, papilionaceous.		
Ovary apocarpous.	RANUNCULACEÆ (<i>Ranunculus order</i>). Herbs. Stamens polyandrous. Petals definite. Leaves alternate or radical, with dilated sheathing petioles.		
Ovary syncarpous.	NYMPHÆACEÆ (<i>Water-lily order</i>). Aquatic herbs. Stamens polyandrous. Petals indefinite. Leaves peltate or cordate, and floating.		
Ovary unilocular.			
Placentas parietal.			
Corolla regular.			
Leaves radical or alternate.			
Leaves exstipulate.			
Stamens polyandrous.		PAPAVÉRACEÆ (<i>Poppy order</i>). Herbs. Petals four. Sepals two.	
Stamens oligandrous.		DROSÉRACEÆ (<i>Sundew order</i>). Herbs. Leaves covered with glandular hair. Styles distinct.	
		TAMARICACEÆ (<i>Tamarisk order</i>). Herbs. Leaves scale-like.	
Leaves opposite.			
Leaves exstipulate.			
Stamens polyandrous.		CISTACEÆ (<i>Cistus order</i>). Shrubs or herbs. Petals five.	
Leaves stipulate.			
Stamens polyandrous.		CISTACEÆ.	
Stamens oligandrous.		FRANKENIACEÆ (<i>Frankenia order</i>). Herbs or undershrubs.	

Corolla irregular.

Leaves radical or alternate.

Leaves exstipulate.

Stamens polyandrous.

RESEDACEÆ (*Mignonette order*). Herbs. Petals four to six. Capsule opens at the top before maturity.

Stamens oligandrous.

FUMARIACEÆ (*Fumitory order*). Herbs. Stamens six, diadelphous.

Leaves stipulate.

Stamens oligandrous.

VIOLACEÆ (*Violet order*). Herbs. Stamens five, connective prolonged above the anther-cells, filaments dilated.

Placentas axile.

Corolla regular.

Leaves opposite.

Leaves exstipulate.

Stamens oligandrous.

CARYOPHYLLACEÆ (*Pink order*). Herbs. Placentas free-central. Stigmas papillose along their inner surface.

Anomalous Order—*Plumbaginacea*. One ovule, which is pendulous from a funiculus arising from the bottom of the cell.

Ovary bilocular.

Placentas parietal.

Corolla regular.

Leaves radical or alternate.

Leaves exstipulate.

Stamens oligandrous.

CRUCIFERÆ (*Crucifer order*). Herbs, or seldom undershrubs. Sepals and Petals four each. Stamens six, tetradynamous.

<p>Placentas axile. Corolla regular. Leaves opposite. Leaves exstipulate. Stamens oligandrous.</p>	<p>ACERACEÆ (<i>Maple tribe</i>). Trees. Fruit a samara, composed of two winged carpels.</p>
<p>Corolla irregular. Leaves radical or alternate. Leaves exstipulate. Stamens oligandrous.</p>	<p>POLYGALACEÆ (<i>Milkwort order</i>). Shrubs or herbs. Stamens eight, diadelphous.</p>
<p>Ovary plurilocular. Placentas axile. Corolla regular. Leaves radical or alternate. Leaves exstipulate. Stamens oligandrous.</p>	<p>LINACEÆ (<i>Flax order</i>). Herbs or undershrubs. Leaves simple, entire. Stamens rarely fewer than five (but in exotic genera ten), free, or the filaments very shortly united at the base.</p> <p>OXALIDACEÆ (<i>Wood-sorrel order</i>). Herbs, undershrubs, or trees. Leaves compound, palmately trifoliolate. Stamens ten, monadelphous.</p> <p><i>Ericaceæ</i> (<i>Gen. Pyrola</i>). Stamens ten, distinct.</p>
<p>Leaves stipulate. Stamens polyandrous.</p>	<p>MALVACEÆ (<i>Mallow order</i>). Herbs. Stamens monadelphous.</p>
<p>Leaves opposite. Leaves exstipulate. Stamens polyandrous.</p>	<p>TILIACEÆ (<i>Lime order</i>). Trees. Stamens free or united shortly into several clusters.</p>
<p>Leaves opposite. Leaves exstipulate. Stamens polyandrous.</p>	<p>HYPERICACEÆ (<i>Hypericum order</i>). Shrubs or herbs. Stamens polyadelphous.</p>

<p>Stamens oligandrous. Leaves stipulate. Stamens oligandrous.</p>	<p>LINACEÆ.</p> <p>ELATINACEÆ (<i>Elatine order</i>). Annual March plants. Leaves entire. Stigmas capitate. GERANIACEÆ (<i>Geranium order</i>). Herbs or shrubs. Leaves divided, cut, or toothed. Leaves represented by scales).</p>
<p>Leafless <i>Ericaceæ</i> (<i>Gen. Monotropa</i>, leaves represented by scales). Corolla irregular. Leaves radical or alternate. Leaves exstipulate. Stamens oligandrous.</p>	<p>BALSAMINACEÆ (<i>Balsam order</i>). Succulent herbs. Leaves simple.</p>

Group II.—PERIGYNÆ (Calycifloræ).

Stamens perigynous. Ovary wholly or partially superior.

<p>Ovary monocarpellary. Ovary polycarpellary. Ovary apocarpous. Ovary syncarpous. Ovary unilocular. Placentas parietal.</p>	<p>PAPILIONACEÆ (<i>Pea-flower tribe</i>). Herbs, shrubs, or trees. Stamens oligandrous and mon-, or di-adelphous. Corolla irregular, papilionaceous. ROSACEÆ (<i>Rose order</i>). Herbs, shrubs, or trees. Stamens polyandrous. Corolla regular. ROSACEÆ. Leaves stipulate. CRASSULACEÆ (<i>Stonecrop order</i>). Herbs or shrubs. Leaves exstipulate. Flowers symmetrical.</p>
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Corolla regular.
 Leaves radical or alternate.
 Leaves exstipulate.
 Stamens oligandrous.
 Leaves stipulate.
 Stamens oligandrous.

Placentas axile.
 Corolla regular.
 Leaves radical or alternate.
 Leaves exstipulate.
 Stamens polyandrous.

Ovary bilocular.
 Placentas parietal.
 Corolla regular.
 Leaves radical or alternate.
 Leaves exstipulate.
 Stamens oligandrous.
 Leaves opposite or whorled.
 Leaves exstipulate.
 Stamens oligandrous.

Placentas axile.
 Corolla regular.
 Leaves opposite or whorled.
 Leaves exstipulate.
 Stamens oligandrous.

Ovary plurilocular.
 Placentas axile.

SAXIFRAGACEÆ (*Saxifrage order*) (*Gen. Parnassia*).
 Herbs. Ovary with a distinct style for each
 carpel.

Paronychiaceæ (*Gen. Corrigiola*).

PORTULACÆ (*Purslane order*). Succulent herbs.
 Leaves entire. Sepals two or, rarely, three.

SAXIFRAGACEÆ.

SAXIFRAGACEÆ.

LYTHRACEÆ (*Loosestrife order*). Herbs. Leaves
 entire. One style.

Corolla regular.

Leaves radical or alternate.

Leaves stipulate.

Stamens polyandrous.

Stamens oligandrous.

Leaves opposite or whorled.

Leaves exstipulate.

Stamens oligandrous.

Leaves stipulate.

Stamens oligandrous.

ROSACEÆ.

RHAMNACEÆ (*Buckthorn order*). Trees or shrubs.
Leaves simple. Stamens opposite petals.

LYTHRACEÆ.

CELASTRACEÆ (*Spindle-tree order*). Shrubs or trees.
Leaves simple. Stamens alternate with petals.

Group III.—EPIGYNÆ (Calycifloræ).

Stamens epigynous. Ovary inferior.

Ovary polycarpellary.

Ovary syncarpous.

Ovary unilocular.

Placentas parietal.

Corolla regular.

Leaves radical or alternate.

Leaves exstipulate.

Stamens oligandrous.

RIBESIACEÆ (*Currant order*). Shrubs. One style.
Stamens 4—5, alternate with the petals. Leaves lobed.

Ovary bilocular.

Placentas axile.

Corolla regular.

Leaves radical or alternate.
Leaves exstipulate.
Stamens oligandrous.

UMBELLIFERÆ (*Umbellate order*). Herbs. Two styles. Stamens 5, alternate with the petals. Leaves variously divided and sheathing. Flowers umbellate. Fruit dry; carpels separate from the axis when ripe.

Leaves opposite or whorled.
Leaves exstipulate.
Stamens oligandrous.

ONAGRACEÆ (*Evening Primrose order*), (*Gen. Circaea*, Stamens two). Herbs. Stamens 8-4-2. Perianth in twos or fours. One style. Flowers on terminal spikes or racemes.

CORNACEÆ (*Dogwood order*). Trees, shrubs, or herbs. Stamens 4, alternate with petals. One style. Flowers capitate, umbellate or corymbose.

Ovary plurilocular.
Placentas axile.

Corolla regular.
Leaves radical or alternate.
Leaves exstipulate.
Stamens oligandrous.

ONAGRACEÆ (*Gen. Enothiera*, stamens 8).
ARALIACEÆ (*Ivy order*). Shrubs, trees or climbers, rarely herbs. Stamens 5. Fruit succulent. Flowers umbellate or capitate.

Leaves opposite or whorled.
Leaves exstipulate.
Stamens oligandrous.

ONAGRACEÆ (*Gen. Ludwigia, Epilobe*). Leaves are sometimes irregularly scattered in latter).
HALORAGACEÆ (*Marestail order*). Aquatic herbs. Stigmas sessile in British genera. Flowers in terminal panicles or racemes.

SUB-CLASS II.—GAMOPETALÆ (Calycifloræ and Corollifloræ).

Petals wholly or partially coherent.

Group I.—EPE T A L Æ.

Stamens free from corolla.

Ovary polycarpellary.		
Ovary syncarpous.		
Ovary inferior.		
Ovary bilocular.	—	CAMPANULACEÆ (<i>Harbell order</i>). Herbs. Stamens as many as corolla-lobes. Anthers free, dehiscent longitudinally.
Corolla regular.	—	
Leaves radical or alternate.		
Ovary plurilocular.	—	CAMPANULACEÆ. VACCINIACEÆ (<i>cranberry order</i>). Shrubs. Stamens twice as many as corolla-lobes. Anthers bilocular, dehiscent by pores.
Corolla regular.	—	
Leaves radical or alternate.		
Corolla irregular.	—	LOBELIACEÆ (<i>Lobelia order</i>). Lactescent herbs or shrubs. Stamens five. Anthers coherent.
Leaves radical or alternate.		
Ovary superior.		
Ovary plurilocular.		
Corolla regular.		ERICACEÆ (<i>Heath order</i>). Shrubs. Stamens usually twice as many as corolla-lobes. Anthers dehiscent by terminal pores.
Leaves opposite or whorled.		

Group II.—EPIPETALÆ.

Stamens adherent to corolla.

Ovary polycarpellary.

Ovary apocarpous. AROCYNACEÆ (*Dogbane order*). Herbs. Leaves opposite. Corolla regular. Stamens as many as corolla-lobes. Styles united.
Crossulaceæ (*Gen. Cotyledon*). Herbs or succulent shrubs. Leaves scattered. Corolla regular. Stamens twice as many as corolla-lobes. Styles distinct.

Ovary syncarpous.

Ovary inferior.

Ovary unilocular.

Corolla regular.

Leaves radical or alternate.

PRIMULACEÆ (*Gen. Samolus*). Herbs. Flowers small and white, in a terminal raceme).

COMPOSITÆ (*Composite order*). Herbs or shrubs. Florets in capitula on a common receptacle and surrounded by an involucre. Stamens syngonesious. Ovary solitary and erect.

Leaves opposite or whorled.

Corolla irregular.

Leaves radical or alternate.

Leaves opposite or whorled.

COMPOSITÆ.

COMPOSITÆ.

VALERIANACEÆ (*Valerian order*). Herbs. Flowers in terminal corymbs or panicles. Stamens fewer than corolla lobes. Ovary solitary, pendulous and exalbuminous.

DIPSACEÆ (*Teasel order*). Herbs or undershrubs. Florets capitate, with a common involucre, each floret surrounded also by an involucre. Anthers free. Ovary solitary, pendulous and albuminous.

Ovary bilocular.

Corolla regular.

Leaves opposite or whorled.

RUBIACEÆ (*Madder order*). Herbs. Leaves with interpetiolar stipules.

Ovary plurilocular.

Corolla regular.

Leaves radical or alternate.

CUCURBITACEÆ (*Gen. Bryonia*). Climber. Flowers dioecious.

Leaves opposite or whorled.

CAPRIFOLIACEÆ (*Honeysuckle order*). Trees, shrubs, or herbs. Leaves exstipulate.

Ovary superior.

Ovary unilocular.

Corolla regular.

Leaves radical or alternate.

PRIMULACEÆ (*Primrose order*). Herbs. Stamens as many as and opposite to corolla-lobes. Placenta free-central, bearing many ovules.

PLUMBAGINACEÆ (*Flax order*). Herbs or undershrubs. Stamens five, opposite to corolla-lobes. Ovule solitary, suspended from a funiculus which arises from the base of the cell.

GENTIANACEÆ (*Gen. Menyanthes and Linanthemum*). Aquatic plants.

Leaves opposite or whorled.

GENTIANACEÆ (*Gentian order*). Herbs. Corolla contorted. Stamens alternate with corolla-lobes. Placentas parietal.

PRIMULACEÆ.

Portulacææ (*Gen. Montia*). Corolla split open in front. Stamens three.

Corolla irregular.

Leaves radical or alternate.

LENTIBULARIACEÆ (*Butterwort order*). Marsh or aquatic plants. Stamens two, alternate with corolla-lobes. Placenta free-central.

Leafless. OROBANCHACEÆ (*Dodder order*). Parasitic herbs.

Ovary bilocular.

Corolla regular.

Leaves radical or alternate.

CONVOLVULACEÆ (*Bindweed order*). Twining or trailing herbs. Stamens five (rarely four), alternate with corolla-lobes. Two (rarely one) ovules in each cell. Seed exalbuminous.

SOLANACEÆ (*Nightshade order*). Herbs or shrubs. Stamens mostly five (rarely four), alternate with corolla-lobes. Several ovules in each cell. Seed albuminous.

PLANTAGINACEÆ (*Ribwort order*). Herbs. Stamens four, longer than, and alternate with, corolla-lobes. Seeds albuminous.

Leaves opposite or whorled.

Leafless. CORVOLVULACEÆ.

Corolla irregular.

Leaves radical or alternate.

(*Gn.*, *Uscuta*. Parasitic.)

OLEACEÆ (*Olive and Ash order*). Trees or shrubs. Stamens two, alternate with ovary-cells.

Corolla irregular.

Leaves radical or alternate.

SCROPHULARIACEÆ (*Figwort order*). Herbs. Stamens two or four, rarely five. Corolla personate. Ovules several in each cell.

Leaves opposite or whorled.

Ovary plurilocular.

Corolla regular.

Leaves radical or alternate.

PLANTAGINACEÆ.

AQUIFOLIACEÆ (*Holly order*). Shrubs or trees with evergreen leaves. Stamens four or six. Seeds albuminous.

POLEMONIACEÆ (*Phlox order*). Herbs, or rarely shrubs. Stamens five. Seeds albuminous.

BORAGINACEÆ (*Bugloss order*). Herbs rough with hairs. Stamens five. Seeds exalbuminous. Ovary deeply four-lobed, style from between the lobes.

Corolla irregular.

Leaves opposite or whorled.

LABIATE (*Labiatae* order). Herbs, or rarely shrubs with quadrangular stems. Stamens two or four, didynamous. Ovary deeply four-lobed, style from between the lobes.

VERBENACEÆ (*Vervain* order). Herbs, shrubs, or trees. Stamens two—four didynamous. Ovary not deeply lobed. Style terminal.

BORAGINACEÆ. (*Gen. Echium.*)

Leaves radical or alternate.

CLASS II.—MONOCHLAMYDEÆ.

Perianth single.

Flowers hermaphrodite.

Ovary monocarpellary.

Ovary polycarpellary.

(Ovary apocarpous.

Ovary syncarpous.

Ovary inferior.

Ovary unilocular.

Leaves radical or alternate.

Leaves exstipulate.

Haloragaceæ (*Gen. Hippuris*). Aquatic plants.

Rosaceæ (*Gen. Alchemilla, Sanguisorba, Poterium*). Herbs or undershrubs.

Rosaceæ (*Gen. Alchemilla, Sanguisorba, Poterium*). Stamens perigynous. Seeds exalbuminous.

Ranunculaceæ (*Gen. Thalictrum, Clematis, Anemone, Caltha*). Stamens hypogynous. Seeds albuminous.

SANTALACEÆ (*Sandal-wood* order). Herbs or undershrubs. Stamens 4-5, opposite to perianth-lobes. Ovules 2-3, pendulous.

Sacifragaceæ (*Sp. Chrysosplenium alternifolium*). Stamens 8-10.

Saxifragaceæ. (*Sp. Chrysozplenium oppositifolium*).

Aristolochiaceæ. (*Gen. Asarum.*)

Onagraceæ. (*Gen. Ludwigia.*)

CHENOPODIACEÆ (*Goosefoot order*). Herbs or under-shrubs. Male perianth in 3 or 5 parts. Stamens opposite to corolla-lobes. Ovule solitary. Styles or stigmas two or more.

POLYGONACEÆ (*Smartweed order*). Herbs. Stipules ochraceous. Ovule solitary, erect, orthotropous.

Caryophyllaceæ. Herbs. Stamens usually twice as many as perianth-lobes, hypogynous. Ovules many on a free-central placenta. Stigmas papillose along inner surface.

Primulaceæ (*Gen. Chlora*). A low decumbent perennial. Stamens 5, alternate with perianth-lobes. Ovules many, on a free-central placenta. Style 1).

THYMELACEÆ (*Daphne order*). Shrubs. Stamens 8, inserted into perianth-tube. Ovule solitary, suspended, anatropous. Style 1.

PARONYCHIACEÆ (*Knautwort order*). Annual or perennial herbs. Stamens 5, alternating with five small filaments. Ovule solitary. Styles, or sessile stigmas, 2 or 3.

PARONYCHIACEÆ.

Leaves opposite.
Leaves exstipulate.

Ovary plurilocular.

Leaves radical or alternate.
Leaves exstipulate.
Leaves opposite or whorled.
Leaves exstipulate.

Ovary superior.

Ovary unilocular.

Leaves radical or alternate.
Leaves exstipulate.

Leaves stipulate.

Leaves opposite or whorled.
Leaves exstipulate.

Leaves stipulate.

Ovary bilocular.
 Leaves radical or alternate.
 Leaves stipulate.
 Leaves opposite or whorled.
 Leaves exstipulate.

Ulmaceæ (*Ulm order*). Trees. Stamens opposite
 perianth-lobes. One ovule in each cell. Styles
 or stigmas 2. Fruit a single samara or a drupe.

Lythraceæ. (*Gen. Peplis*.)

Ovary plurilocular.
 Leaves radical or alternate.
 Leaves stipulate.

Rhamnaceæ (*Gen. Rhamnus*).

Flowers diclinous.

Rosaceæ. (*Gen. Poterium*.)

Ovary monocarpellary.
 Ovary polycarpellary.
 Ovary apocarpous.
 Ovary syncarpous.
 Ovary inferior.

Ovary unilocular.
 Leaves opposite or whorled.
 Leaves exstipulate.

LOBANTHACEÆ (*Mistletoe order*). Shrubby ever-
 green parasites. Stamens 4, opposite to perianth-
 lobes.

Ovary plurilocular.
 Leaves radical or alternate.
 Leaves stipulate.
 Leaves opposite or whorled.
 Leaves exstipulate.

CORYLACEÆ (*Oak order*). Trees or shrubs Flowers
 in catkins. Fruit in a cupule.

Haloragaceæ.

Ovary superior.
 Ovary unilocular.

Leaves radical or alternate.
Leaves exstipulate.

Leaves opposite or whorled.
Leaves stipulate.

Ovary bi- or plurilocular.
Leaves opposite or whorled.

CHENOPODIACEÆ.
ELÆAGNACEÆ (*Oleaster order*). Shrubs or trees with silvery-scurfy leaves, Male perianth of 2 scales. Ovule solitary, erect. One style and simple stigma.

URTICACEÆ (*Nettle order*). Herbs. Stamens as many as, and opposite to, perianth-lobes. Ovule solitary. One or two styles or stigmas.

EUPHORBIACEÆ (*Spurge order*). Herbs, shrubs, or trees. Ovule solitary or twin, suspended. Radicle superior.

EMPETRACEÆ (*Crowberry order*). Low shrubby evergreens. Ovule solitary, ascending. Radicle inferior.

CLASS III.—ACHLAMYDEÆ.

Perianth absent or bract-like.

Flowers hermaphrodite. *Oleaceæ* (*Gen. Fraxinus*).

Flowers diclinous.

Staminal flowers not in catkins.

Ovary unilocular. CERATOPHYLLACEÆ (*Hornwort order*). Aquatic herbs. Leaves dissected and whorled. Stamens several. Style 1. Ovule solitary, suspended, orthotropous.

Ovary trilocular. *Euphorbiaceæ*. (*Gen. Euphorbia*.)

Ovary quadrilocular. CALLITRICHACEÆ (*Starwort order*). Aquatic annuals. Leaves entire and opposite. Stamens solitary. Styles 2. Ovules 4.

Staminal flowers in catkins.

Ovary unilocular.

Ovule solitary.

MYRICACEÆ (*Bog-myrtle order*).

Shrubs. Monœcious or diœcious. Leaves exstipulate.

Ovules several.

SALICACEÆ (*Willow order*).

Trees or shrubs. Dioecious. Leaves stipulate. Seeds
omose.

Ovary bilocular.

BETULACEÆ (*Birch order*).

Trees or shrubs. Monœcious. Leaves stipulate. Ovule
solitary in each cell. Seeds pendulous.

SUBDIVISION II.—*Gymnospermiæ*.

5

Ovules borne on open carpels and fertilized by the direct action of pollen.

PINACEÆ (*Pine order*).

Trees or shrubs.

Leaves tufted or imbricated, mostly evergreen and linear. Monoecious or dioecious.

Female flowers in cones.

TAXACEÆ (*Yew order*).

Trees or shrubs.

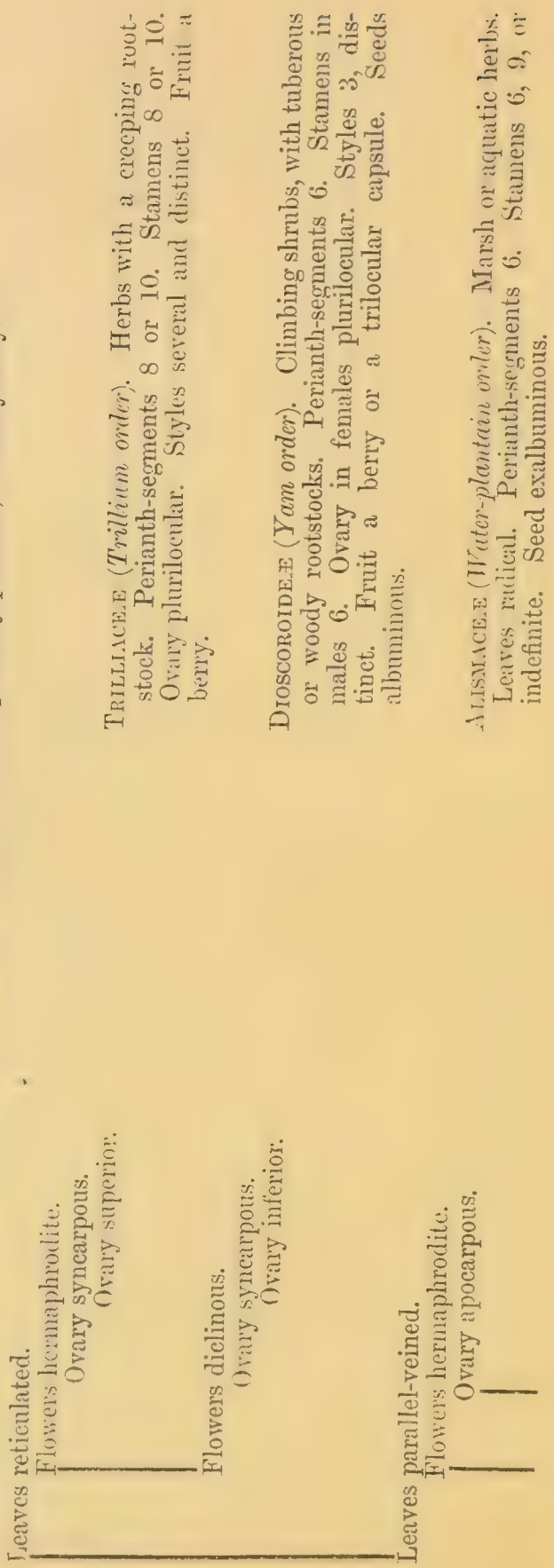
Leaves evergreen and linear. Mostly dioecious. Female flowers composed of a solitary
ovule, which is either terminal, or in the axil of a bract.

DIVISION II.—MONOCOTYLEDONES or ENDOGENÆ.

Embryo with one or several alternate cotyledons. Wood endogenous. Leaves usually parallel-veined. Flowers usually formed on a ternary type.

CLASS I.—PETALOIDEÆ.

Perianth double, whorled, trimerous, wholly or partially petaloid, or rarely scaly.



TRILLIACEÆ (*Trillium order*). Herbs with a creeping root-stock. Perianth-segments 8 or 10. Stamens 8 or 10. Ovary plurilocular. Styles several and distinct. Fruit a berry.

DIOSCOROIDEÆ (*Yam order*). Climbing shrubs, with tuberous or woody rootstocks. Perianth-segments 6. Stamens in males 6. Ovary in females plurilocular. Styles 3, distinct. Fruit a berry or a trilobular capsule. Seeds albuminous.

ALISMACEÆ (*Water-plantain order*). Marsh or aquatic herbs. Leaves radical. Perianth-segments 6. Stamens 6, 9, or indefinite. Seed exalbuminous.

Ovary syncarpous.

Ovary superior.

Stigmas sessile.

Stigmas distinct.

ALISMACEÆ (*Gen. Triglochin*). Tufted herbs. Leaves radical Perianth sepaloïd or scaly. Stigmas 3. Stamens 6, anther extrorse. Embryo straight, exalbuminous).

Style solitary.

Stigmas distinct.

JUNCACEÆ (*Rush order*). Grass-like or sedgy herbs, with fibrous roots or a rhizome. Perianth sepaloïd or scaly. Stigmas 3. Stamens 6 or 3, anthers introrse. Fruit capsular, loculicidal. Seed albuminous.

Stigma simple or 3-lobed.

LILIACEÆ (*Lily order*). Herbs with bulbs, tubers, rhizomes, or leafy flowering-stems. Perianth petaloïd. Stamens 6, anthers introrse. Fruit capsular, loculicidal. Seed albuminous.

Styles several.

MELANTHACEÆ (*Colchicum order*). Herbs with bulbs, tubers, or fibrous roots. Perianth petaloïd. Stamens 6, anthers extrorse. Fruit capsular, septicidal. Seed albuminous.

Ovary inferior.

Style adherent to stamens.

ORCHIDACEÆ (*Orchid order*). Perennial herbs, with fibrous or tuberous roots. Perianth irregular, mostly petaloïd. Stamens 1 or 2, gynandrous. Ovary unilocular.

Style free from stamens.

Stigmas distinct.

IRIDACEÆ (*Flag order*). Perennial herbs, with bulbs, corns, or rhizomes. Leaves radical or equitant. Perianth regular and petaloïd. Stamens 3, extrorse. Stigmas often petaloïd. Ovary trilocular.

Stigma simple or 3-lobed.

AMARYLLIDACEÆ (*Amaryllis order*). Herbs with a bulbous rootstock. Leaves radical. Perianth regular and petaloïd. Stamens 6, introrse. Ovary trilocular.

Flowers dichinous.
 Ovary syncarpous.
 Ovary superior.
 Style solitary.
 Ovary inferior.
 Styles several.

ERIOCAULACEÆ (*Eriocaulon order*). Aquatic or marsh herbs.
 Perianth regular, sepaloid. Seed albuminous.

HYDROCHARIDACEÆ (*Frog-bit order*). Aquatic herbs. Perianth
 regular, petaloid. Seed exalbuminous.



CLASS II.—SPADICIFLORÆ.

Flowers arranged on a spadix, which is naked or enclosed in a spathe.

Leaves reticulated.
 Spadix distinct.
 Ovary solitary.

Perianth absent or scaly.

AROIDÆÆ (*Arum order*). Herbs. Leaves usually broad, radical or alternate. Fruit a
 berry. Ovules several. Seeds usually albuminous.

Leaves parallel-veined.
 Spadix distinct.
 Ovary solitary.

AROIDEÆ. Filaments short.
 TYPHACEÆ (*Bulrush order*). Marsh or aquatic herbs. Leaves linear and sedge-like.
 radical and alternate. Filaments long. Ovule solitary. Fruit a seed-like nut.
 Seed albuminous.

Spadix a short peduncle.
Ovary solitary.

LEMNACEÆ (*Duckweed order*). Floating plants. Stem and foliage represented by flat floating fronds. Fruit capsular or membranous. Ovules several or solitary. Seeds albuminous.

Ovaries several.

NAIDACEÆ (*Naiad order*). Aquatic plants. Leaves cellular. Fruit composed of seed-like nuts. One ovule in each cell. Seeds exalbuminous.

NAIDACEÆ.

CLASS III.—GLUMIFLORÆ.

Perianth scaly, green or brown, and imbricated.

CYPERACEÆ (*Sedge order*). Grass-like or rush-like herbs. Stems solid. Leaf-sheaths tubular, not slit. Each flower in axil of one glume. Glumes mostly brown. Style more or less divided into two or three linear stigmas. Embryo within albumen.

GRAMINEACEÆ (*Grass order*). Herbs. Stems hollow, except at nodes. Leaf-sheaths slit. Each flower enclosed in a pair of glumes. Glumes mostly green or purplish. Styles two or three, stigmas feathery. Embryo outside albumen.

SUB-KINGDOM CRYPTOGRAMIA.

Flowerless plants. Propagate by spores not containing an embryo.

DIVISION.—ACOTYLEDONES.

No cotyledons. Stem, when present, acrogenous. Leaves, when present, with a forked or without true venation.

SUBDIVISION 1.—*Angiosporæ* or *Acrogenæ*.

Stems and leaves distinct. Stomata present. Roots adventitious. Have more or less vascular tissue. Spores produced in sporanges, which are closed until maturity. Spermatozoids spiral.

CLASS I.—SPOROGAMIA.

Produce two kinds of spores (microspores and megaspores), in which the male and female sexual organs (antheridia and archegonia) are developed during germination. The spores are contained in spore-sacs (sporangies or thecae), which are produced in stalked capsules or spore-fruits (sporocarps) arising from near the bases of leaves or leafstalks; or, the sporanges are sessile in the axils of imbricated leaves or bracts, which often form terminal spikes.

Sporanges in stalked sporocarps, arising from near bases of leaves or leafstalks.

MARSILLACEÆ (*Pepper-wort order*). Creeping or floating herbs. Stem an inconspicuous rhizome. Leaves small, stalked or sessile, circinate in venation.

Sporanges sessile in axils of imbricated leaves or bracts, which often form terminal spikes.

LYCOPODIACEÆ (*Club-moss order*). Herbaceous moss-like plants. Stem creeping or bifurcating. Leaves small and closely imbricated, straight in venation.

ISOËTACEÆ (*Quill-wort order*). Aquatic or marsh plants. Stem perennia and corn-like. Leaves linear, sessile and tufted, straight in venation.

CLASS II.—THALLOGAMIA.

Produce spores of one kind, which germinate and produce a green cellular frond (prothallium), on which the antheridia and archegonia are developed. The spores are contained in sporanges, which are collected in clubs or spikes, terminating fertile stems; or the sporanges are superficial on the dorsal surface or edges, or on metamorphosed lobes of leaves.

Foliage abortive. Sporangies collected in clubs or spikes, which terminate the fertile stems.

EQUISETACEÆ (*Horsetail order*). Herbs. Stem fistular, longitudinally striated, jointed, simple or verticillately branched. Leaves abortive, and represented by whorls of scales at the joints. Sporangies peltate-shaped, and attached by stalks to the central axis of the terminal spike in which they are borne. Spores with elaters.

Foliage well developed. Sporangies superficial, on dorsal surface or margins, or on metamorphosed lobes of leaves.

FILICES (*Fern order*). Herbs. Stem represented by a subterranean horizontal or vertical rhizome. Leaves or fronds well developed, radical or alternate with a bifurcated venation, circinate in vernation, except in Ophioglossaceæ. Sporangies with or without an annulus, situated on dorsal surface or margins, or on metamorphosed lobes of leaves, often collected in clusters (sori), which are naked or covered with a membrane (indusium).

Sub-Orders :—

OPHIOGLOSSACEÆ. Fronds straight in vernation. Sporangies distinct, exannulate, borne on margins of metamorphosed frond-lobes.

DANÆACEÆ. Fronds circinate in vernation. Sporangies coherent, exannulate, dorsal.

POLYPODIACEÆ. Fronds circinate in vernation. Sporangies distinct, annulate, dorsal or marginal.

CLASS III.—AXOGAMIA.

Spores after germination give rise to branched filaments, whence grow leafy stems bearing antheridia and archegonia. Sporangia result from the fertilization of the archegonia.

Foliage represented by a lobed leaflike expansion or frond.

HEPATICÆ (*Liverwort order*). Thalloid hepaticæ. Sporangia immersed, sessile, pedicellate, or borne on under surface of peltate stalked receptacles which arise from the marginal sinuses of the frond. Dehiscence valvular or irregular. Without a columella (except in Anthocerotæ). Spores mixed with elators (except in Ricciacæ).

Sub-Orders:—

MARCIANTACEÆ. Sporangia with an involucre (perigone) borne on under surface of peltate stalked receptacles, which arise from the marginal sinuses of the frond. Dehiscence by teeth or irregular. No columella. Spores mixed with elators. Antheridia in distinct receptacles.

RICCIACEÆ. Sporangia without an involucre, immersed or sessile. Dehiscence irregular. No columella. Spores without elators.

ANTHOCEROTEÆ. Sporangia pod-shaped, without an involucre. Dehiscence by two valves. With a columella. Spores with rudimentary elators.

JUNGERMANNIACEÆ. Sporangia oval, mostly pedicellate with an involucre. Dehiscence by four valves. No columella. Spores with elators.

Foliage well developed. Stem filiform. Leaves distichously imbricated.

HEPATICÆ. Foliaceous Hepaticæ.

Sub-Order:—

JUNGERMANNIACEÆ.

Foliage well developed. Stem simple or branched, erect or creeping. Leaves mostly spirally imbricated.

MUSCI (*Moss order*). Sporanges globular or urn-shaped, pedicillate or sessile. Dehiscence opercular, valvular, or rarely indehiscent. With a columella. Spores without elators.

Sub-orders:—

ANDRÆACEÆ. Sporanges sessile. Dehiscence by four valves.

BRYACEÆ. Sporanges mostly pedicillate. Dehiscence opercular, or rarely indehiscent.

Aquatic plants. Stems composed of tubular verticillately-branched filaments; rooting at the nodes, sometimes incrustated with carbonate of lime.

CHARACEÆ. Reproductive organs of two kinds:—1. Solitary oval nucleules (female), each of which consists of a spore covered with spirally-arranged tubes; each spore, after fertilization, falls off, germinates, and reproduces the plant. 2. Round eight-valved globules (male), each valve of which, when mature, separates, bearing a tuft of articulated filaments, each articulation of which produces a ciliated spermatozoid.

SUBDIVISION II.—*Gymnosporæ* or *Thallogeneæ*.

Produce a thallus. No distinction into stem and leaves. No stomata. No vascular tissue. Spores produced in cells, which form part of the thallus or grow on definite parts of it, and which are open before maturity. Spermatozoids not spiral.

CLASS I.—HYDROPHYTA.

ALGÆ. Aquatic plants. Thallus coloured and foliaceous, filamentous or pulverulent. Propagation various; by fissiparous division, by spores and antheridia, by zoospores, by tetraspores, or by cell-conjugation.

CLASS II.—*AEROPHYTA*.

LICHENACEÆ. Aërial plants. Thallus leathery, horny, crustaceous, or pulverulent. Propagation by green cells (gonidia), which are produced in the central cellular substance of the thallus, and which give rise to vegetative reproduction when set free; and by spores produced in spore-sacs (asci), formed in shield-shaped expansions (apothecia) or in excavated chambers (perithecia). Representatives of antheridia are formed in special excavations (spermagonia), and produce minute, motionless, bacilliform fertilizing corpuscles (spermatia).

CLASS III.—*HYSTEROPHYTA*.

FUNGI. Parasitic plants. Thallus or mycelium consists of branched tubular filaments, forming a cottony mass, which is destitute of chlorophyll and starch. Propagation by propagative buds in the form of simple cells (conidia), and by spores, which in mildews and moulds are free, or contained in asci, and borne at the end of filaments of the mycelium. The higher fungi have the spores naked, or enclosed in asci, in perithecia and apothecia, formed on a stroma or common receptacle, which mostly forms a distinct fruit.

NOTES AND CORRECTIONS.

- Page* 2.—The *Actæa* of RANUNCULACEÆ has a monocarpellary ovary.
,, The leaves of FRANKENIACEÆ are exstipulate.
- Page* 5.—ELATINACEÆ.—For annual *March* plants, read annual *marsh* plants.
- Page* 6.—The placentation of SAXIFRAGACEÆ is axile, not parietal.
,, The placentation of PARONYCHIACEÆ is not parietal, the ovule being solitary on a basal funicle.
- Page* 7.—In RHAMNACEÆ and CELASTRACEÆ, the ovules arise from the base of cells.
- Page* 8.—The petals of UMBELLIFERÆ are sometimes unequal.
- Page* 9.—The ovary is sometimes bilocular in LOBELIACEÆ.
,, Leaves are often alternate or scattered in ERICACEÆ.
- Page* 10.—The ovary of VALERIANACEÆ is more properly trilocular, two of the cells being abortive or empty.
- Page* 11.—The leaves of RUBIACEÆ have not invariably interpetiolar stipules.
- Page* 16.—Leaves of *Parietaria* of URTICACEÆ are alternate and exstipulate.
,, Leaves of EUPHORBIACEÆ and EMPETRACEÆ are not always opposite or whorled.
- Page* 19.—The perianth in *Iris* of IRIDACEÆ, and in *Galanthus* of AMARYLLIDACEÆ, is irregular.

LEUCOMYCEAE. Aerial
spores produced in the
Representatives of
fertilizing corpuscle

gonidia), which are
set free; and by
members (perithecia).
unless, bacilliform

FUNGUS. Parasitic plant
of chlorophyll and
mildews and moulds
the spores naked,
a distinct fruit.

which is destitute
by spores, which in
higher fungi have
which mostly forms

